HP StorageWorks Disk Array XP operating system configuration guide: Windows 2000/2003

XP12000

XP10000

SVS200

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Preface

About this guide

This guide provides information about:

- Requirements and procedures for connecting an XP disk array or the SVS200 to a host system
- Configuring the disk array for use with the Windows 2000/2003 operating system

Intended audience

This guide is intended for system administrators with knowledge of:

- The host hardware
- Windows 2000/2003 operating system
- XP disk arrays and/or the SVS200

Disk arrays

Unless otherwise noted, the term "disk array" refers to these systems:

- HP StorageWorks XP10000 Disk Array
- HP StorageWorks XP12000 Disk Array
- HP StorageWorks 200 Storage Virtualization System

Related documentation

The following documents provide related information:

- *HP StorageWorks XP10000 Disk Array: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*
- *HP StorageWorks 200 Storage Virtualization System: Owner's Guide*

You can find these documents from the Manuals page of the HP Business Support Center web site:

http://www.hp.com/support/manuals

In the Storage section, click **Storage array systems** and then select your product.

Document conventions and symbols

Convention	Element
Blue text: Document conventions and symbols	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Web site addresses
Italic text	Text emphasis and book titles
Bold text	• Keys that are pressed • Text typed into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
`Monospace` text	• File and directory names • System output • Code • Commands, their arguments, and argument values
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text

⚠ WARNING!

Indicates that failure to follow directions could result in bodily harm or death.

△ CAUTION:

Indicates that failure to follow directions could result in damage to equipment or data.

IMPORTANT:

Provides clarifying information or specific instructions.

NOTE:

Provides additional information.

TIP:

Provides helpful hints and shortcuts.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business web site: http://www.hp.com/go/e-updates.

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

Other HP web sites

For additional information, see the following HP web sites:

- http://www.hp.com
- http://www.hp.com/go/storage
- http://www.hp.com/service_locator
- http://www.hp.com/support/manuals

Documentation feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, please send a message to storagedocs.feedback@hp.com. All submissions become the property of HP.

1 Installation

You and your HP service representative each play a role in installation. Your HP service representative is responsible for installing the disk array and formatting the disk devices. You are responsible for configuring the host server for the new devices with assistance from your HP service representative.

Features and requirements

Ask your HP service representative about the latest supported hardware and software.

The disk array has the following features:

- **Storage capacity.** The storage capacity for each model is listed below:
  XP10000: Up to 240 drives for up to 69.2 TB, 48 FC ports
  XP12000: Up to 1152 drives for up to 332 TB, 128 FC ports
  SVS200 Up to 127 TB of external storage, 48 FC ports
- **Server support.** Windows 2000/2003 PC server with the latest HP supported patches
- **Operating system support.** Windows 2000/2003

Before installing the disk array, ensure the environment conforms to these requirements:

- **Host Bus Adapters (HBAs)** Install HBAs and all utilities and drivers. Refer to the adapter documentation for installation details.
- *(Recommended)* HP StorageWorks Remote Web Console XP, Command View XP Advanced Edition or Command View XP with LUN management feature for configuring disk array ports and paths
- *(Recommended)* HP StorageWorks LUN Configuration and Security Manager XP
- *(Optional)* Other available XP software (some may not apply to your system):
  HP StorageWorks Business Copy XP
  HP StorageWorks Continuous Access XP
  HP StorageWorks Continuous Access Extension XP
  HP StorageWorks Continuous Access XP Journal
  HP StorageWorks Auto LUN XP
  HP StorageWorks Data Exchange XP
  HP StorageWorks RAID Manager XP
  HP StorageWorks Cache LUN XP
  HP StorageWorks Auto Path XP
  HP StorageWorks Cluster Extension XP
  HP StorageWorks Performance Advisor XP Software
  HP StorageWorks External Storage XP
  HP StorageWorks XP Disk/Cache Partition Software
  HP StorageWorks Flex Copy XP
  HP StorageWorks XP Data Shredder Software
  HP StorageWorks Performance Control XP

Fibre Channel interface

The XP family of disk arrays and the SVS200 support these Fibre Channel elements:

- Connection speeds of 1 Gbps, 2 Gbps, and 4 Gbps (XP12000/XP10000 only)
- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Public or private arbitrated loop (FC-AL) or direct fabric attach

Even though the interface is Fibre Channel, this guide uses the term "SCSI disk" because disk array devices are defined to the host as SCSI disks.

Device emulation types

The XP family of disk arrays and the SVS200 support these device emulation types:

- **OPEN-3/8/9/E/L/V devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-x*n):** Logical Unit Size Expansion (LUSE) devices combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-3/8/9/E/L/V disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x volumes is designated as OPEN-x*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)
- **LUSE (expanded) CVS devices (OPEN-x*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9*3-CVS.

NOTE:

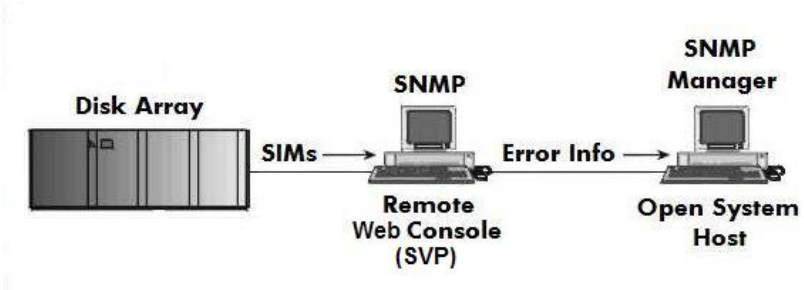
For the SVS200, and the XP12000/XP10000 when connected to external storage devices, HP recommends using OPEN-V as the emulation the array makes visible to the host. This allows external storage LDEVs to be configured without losing data. Using any other emulation may cause data loss in the external storage LUNs.

Failover

The disk arrays support many standard software products that provide host, application, or I/O path failover and management.

SNMP configuration

The XP family of disk arrays and the SVS200 support standard Simple Network Management Protocol (SNMP) for remotely managing arrays. The SNMP agent on the service processor (SVP) performs error-reporting operations requested by the SNMP manager. SNMP properties are usually set from the SVP but they can also be set remotely using Command View (XP arrays only), Remote Web Console, or Command View XP Advanced Edition. Refer to the applicable user's guide for procedures.



RAID Manager command devices

RAID Manager manages Business Copy (BC) or Continuous Access (CA) operations from a host server. To use RAID Manager you must designate at least one LDEV as a command device. This can be done with Command View (XP arrays only), Remote Web Console , or Command View XP Advanced Edition. Refer to the applicable user guide for information about how to designate a command device.

Installation procedures

Perform these actions to install and configure the disk array:

1. Install and configure the disk array
   - Setting the host mode and host group mode
   - Setting the System Option Mode
   - Configuring the Fibre Channel ports
2. Install and configure the host
   - Loading the OS and software
   - Installing and configuring the HBAs
   - Fabric zoning and LUN security
3. Connect the disk array
   - Defining the paths
   - Verifying the host recognizes array devices
4. Configure disk devices
   - Writing signatures
   - Creating and formatting disk partitions
   - Verifying file system operations

Install and configure the disk array

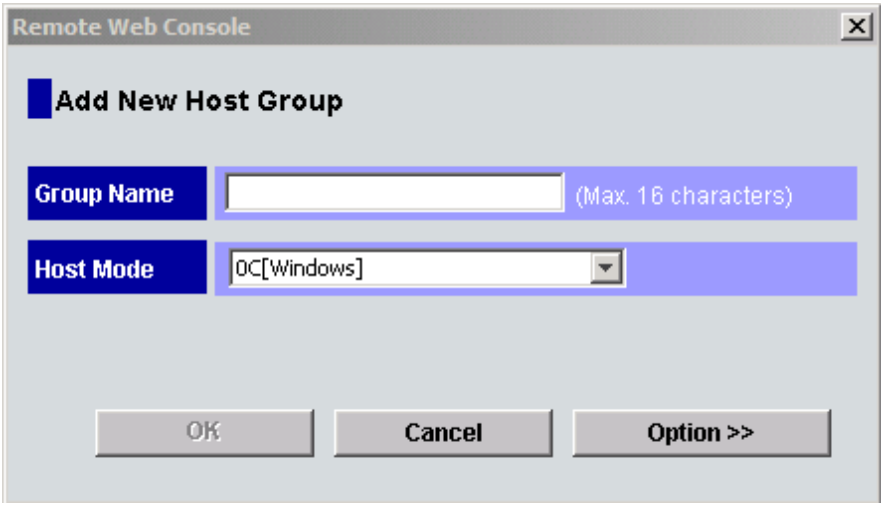
The HP service representative performs these tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing and formatting devices

After these tasks are finished, use Command View (XP arrays only), Remote Web Console, Command View XP Advanced Edition, or LUN Configuration and Security Manager to complete the remaining tasks listed below. If you do not have these programs, your HP service representative can perform these tasks for you.

Setting the host mode and host group mode for the disk array ports

After the disk array is installed, you must set the host mode for each disk array port to match the host OS. Set the host mode using LUN Manager in Remote Web Console (shown), Command View (XP arrays only), or Command View XP Advanced Edition. If these are not available, the HP service representative can set the host mode using the SVP.



The available host mode settings for Windows 2000/2003 are as follows:

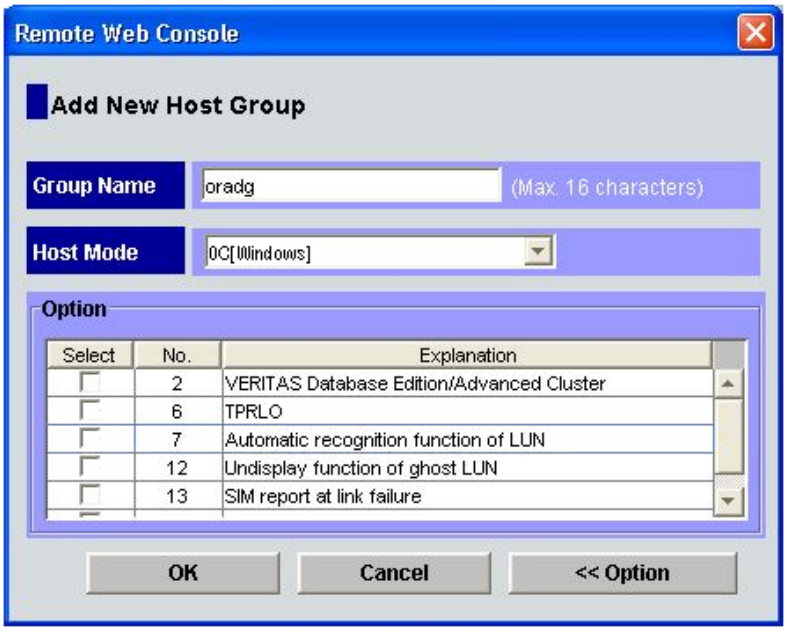
Host mode	Description
2C (available on some array models)	HP recommended. (For use with LUSE volumes when online LUN expansion is required or may be required in the future.)
0C	HP recommended. (Use if future online LUN expansion is not required or planned.)

Volume on XP array (examples)	Volume name as seen on host	
	host mode = 0C	host mode = 2C
OPEN-E	OPEN-E	OPEN-E
OPEN-9	OPEN-9	OPEN-9
OPEN-9***2**	OPEN-9***2**	OPEN-9
OPEN-9***3**-CVS	OPEN-9***3**-CVS	OPEN-9-CVS

△ CAUTION:

The correct host mode must be set for all new installations (newly connected ports) to Windows 2000/2003 hosts. Do not select a mode other than **2C** and **0C** for Windows 2000/2003. Changing a host mode after the host has been connected is disruptive and requires the server to be rebooted.

When a new host group is added, additional host group modes (options) may be configured. The storage administrator must verify if an additional host group mode is required for the host group.



The following host group modes are available for Windows 2000/2003:

Host Group Mode	Function	Default	Comments
2 (Windows 2003 only)	VERITAS DBE+RAC Database Edition/Advanced Cluster for Real Application Clusters or VERITAS® Cluster Server 4.0 with I/O fencing is used.	Inactive	
6	Parameter Setting Failure for TPRLO When using the Emulex HBA in the Windows environment, the parameter setting for TPRLO failed. After receiving TPRLO and FCP_CMD, respectively. PRLO will respond when HostMode=0x0C/0x2C and HostModeOption=0x06. (MAIN Ver.50-03-14-00/00 and later)	Inactive	

△ CAUTION:

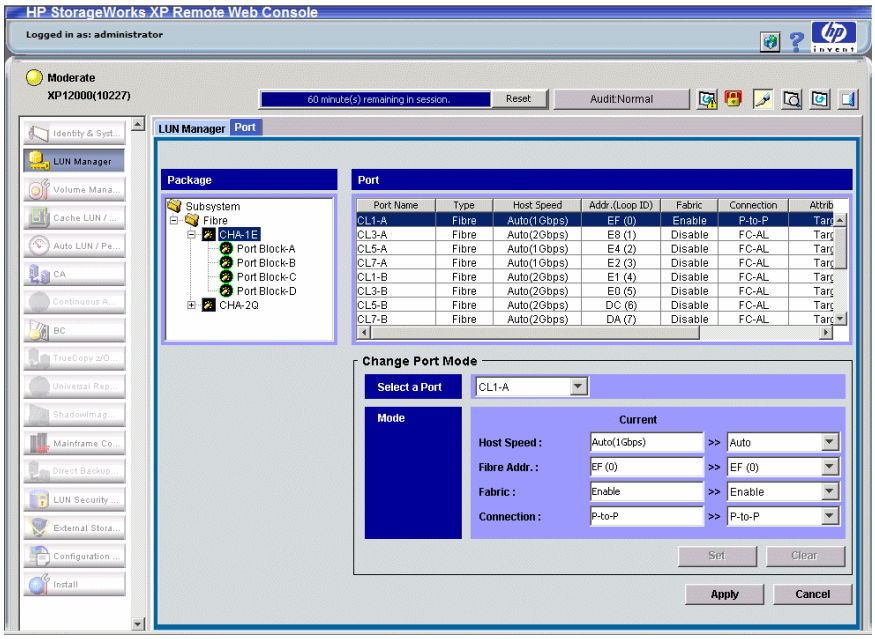
Changing host group modes for ports where servers are already installed and configured is disruptive and requires the server to be rebooted.

Setting the System Option Mode

The HP service representative sets the System Option Mode(s) based on the operating system and software configuration of the host.

Configuring the Fibre Channel ports

Configure the disk array Fibre Channel ports by using Remote Web Console (shown), Command View (XP arrays only), or Command View XP Advanced Edition. Select the settings for each port based on your storage area network topology. Use switch zoning if you connect different types of hosts to the array through the same switch.

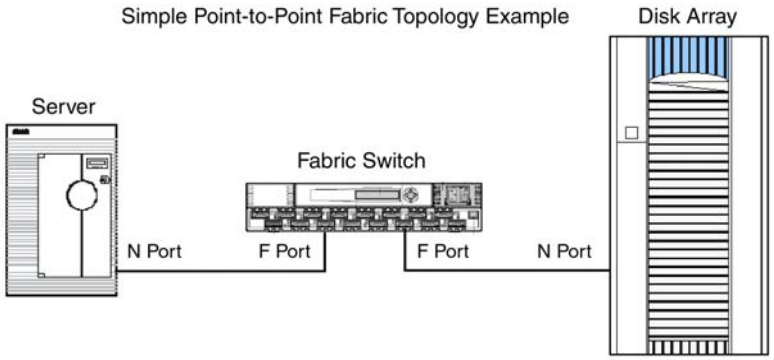


Fibre address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port. For specific values, refer to the *HP StorageWorks LUN Configuration and Security Manager XP User Guide* applicable to your array.

Fabric and connection parameter settings

Set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the www.hp.com website.



Fabric parameter	Connection parameter	Provides
OFF	FC-AL	NL-port (private arbitrated loop)
ON	FC-AL	FL-port (public loop) for loop connection to a switch
ON	POINT-TO-POINT	N-port (fabric port) for connection to a switch
OFF	POINT-TO-POINT	Not supported

Install and configure the host

This section explains how to install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

Loading the OS and software

Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

If you purchased multipath software, install it according to the manufacturer's instructions.

Installing and configuring the HBAs

Install and configure the host bus adapters using the HBA manufacturer's instructions.

HP supplies driver, firmware, and BIOS downloads for commonly available HBAs. These downloads contain HBA settings that are tested and approved by HP. To obtain a download, log onto the HP website at www.hp.com and search for the model name or number of your HBA. Download the file, and follow the installation instructions in the "readme" or documentation file supplied with each download.

Cross-referencing HBAs

The following table identifies both the HP part number and the HBA manufacturer's number for common HBAs.

HP part	OEM partner	OEM adapter	Family (*1)
KGPSA-CB	Emulex	LP8000	1
FCA2355	Emulex	LP9002DC	1
FCA2101	Emulex	LP952	1
FCA2408 / A7298A	Emulex	LP982	2
FCA2404 / AB232A	Emulex	LP9802	2
FCA2404DC	Emulex	LP9802DC	2
A7388A / AB467A	Emulex	LP1050	3
A7387A / AB466A	Emulex	LP1050DC	3
A7560A	Emulex	LP1050EX	3
None	Emulex	LP10000	3
FCA2142/A8002A	Emulex	LPe11002	6
FCA2242/A8003A	Emulex	LPe1150	6
FC2143	Emulex	LP1150	7
FC2243	Emulex	LP11002	7
FCA2214	QLogic	QLA2340	4
FCA2214DC	QLogic	QLA2342	4
FC1142SR	QLogic	QLE2460	8
FC1242SR	QLogic	QLE2462	8
BL20p G2 (FC Mezzanine Card) BL20p G3 (FC Adapter Card)	QLogic Chipset	None	4
BL25p, BL45p (HPALCF 105)	QLogic Chipset	None	4
BL30p, BL35p (FC Balcony Card)	QLogic Chipset	None	4
394757–B2 (E-FC Adapter Card): BL20p G3	Emulex Chipset	None	5
394588–B2 (E-FC Adapter Card): BL25p, BL30p, BL35p, BL45p	Emulex Chipset	None	5
*Note *1: Family number shows which HBAs can use similar driver/BIOS/firmware.*			

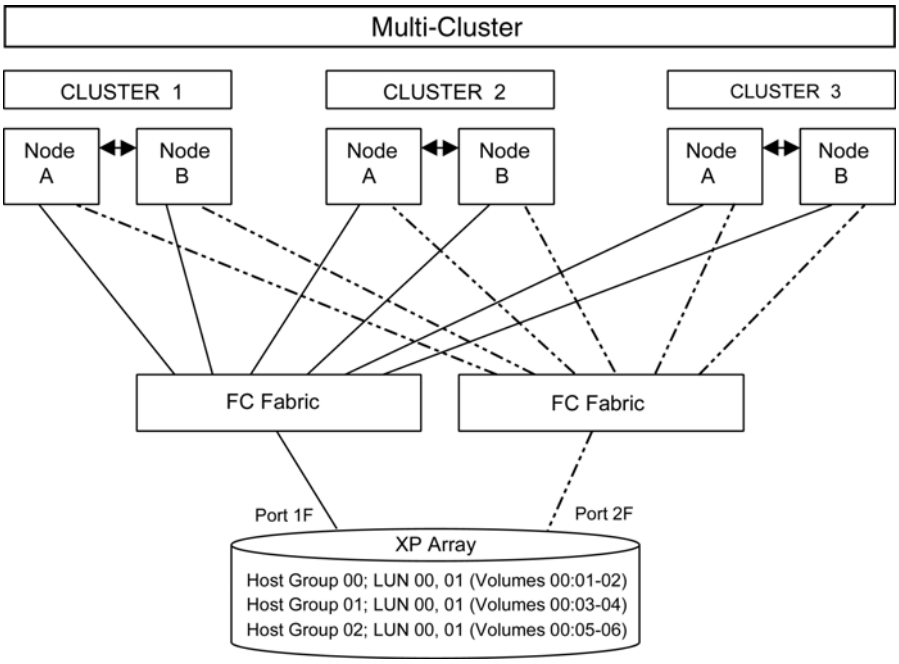
Fabric zoning and LUN security

By using appropriate zoning and LUN security, you can connect various servers with various operating systems to the same switch and fabric:

- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode. All others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.
- QLogic and Emulex HBAs must be in separate zones (a QLogic zone and an Emulex zone) whether the HBAs are in the same or separate servers.
- If booting over the SAN, within a server, the booting HBAs must be from the same vendor. Additional data storage HBAs can be from a different vendor.

Environment	OS mix	Fabric zoning	LUN security
Standalone SAN (non-clustered) Clustered SAN Multi-Cluster SAN	homogeneous (a single OS type present in the SAN)	Not required	Must be used when multiple hosts or cluster nodes connect through a shared port
	heterogeneous (more than one OS type present in the SAN)	Required	

- If you plan to use clustering, install and configure the clustering software on the servers. Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Connect the disk array

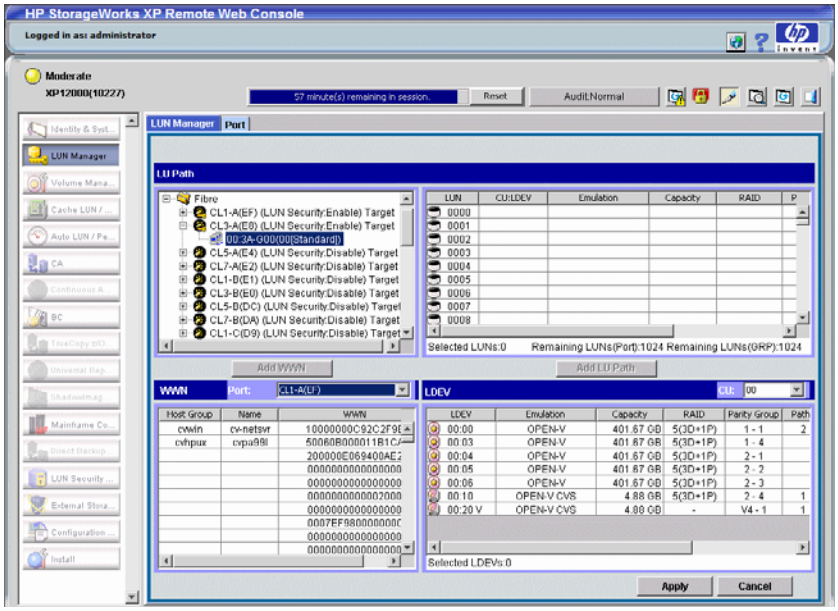
The HP representative connects the cables between the array and the host or between the array and the SAN.

Defining the paths

Use Remote Web Console (shown), Command View (XP arrays only), or Command View XP Advanced Edition to define paths (LUNs) between hosts and volumes in the disk array.

This process is also called "LUN mapping." In Remote Web Console and Command View, LUN mapping includes:

- Configuring ports
- Enabling LUN security on the ports
- Creating host groups
- Assigning host bus adapter WWNs to host groups
- Mapping volumes to host groups (by assigning LUNs



In Command View XP Advanced Edition, LUN mapping includes:

- Configuring ports
- Creating storage groups
- Mapping volumes and WWN/host access permissions to the storage groups

For details see the *LUN Configuration and Security Manager User's Guide* or *Command View XP Advanced Edition Device Manager Web Client User's Guide*. Note the LUNS and their ports, WWNs, nicknames, and LDEVs for later use in verifying host and device configuration.

NOTE:

A LUN assigned a number greater than FF is outside the accepted range of numbers for a Windows server (00 to FE) and will not be recognized by the server or be visible for use.

Windows 2003: To see LUNs, you must create a LUN 0 when using the SCSIPort Miniport Driver. This is not necessary if using the StorPort Miniport Driver.

Windows 2000: A LUN 0 must be created to discover more than LUNs 0 to 7.

Verifying the host recognizes array devices

1. Log into the host as an administrator.
2. Right-click the **My Computer** desktop icon, and click **Manage**.
3. Click **Device Manager**.
4. Click **SCSI** and **RAID Controllers**.
5. Click the host bus adapter to open it, and verify all devices are displayed.
6. Click each device, click **Properties**, and then click **Settings**.
7. Record the device information on the worksheet in Appendix A.

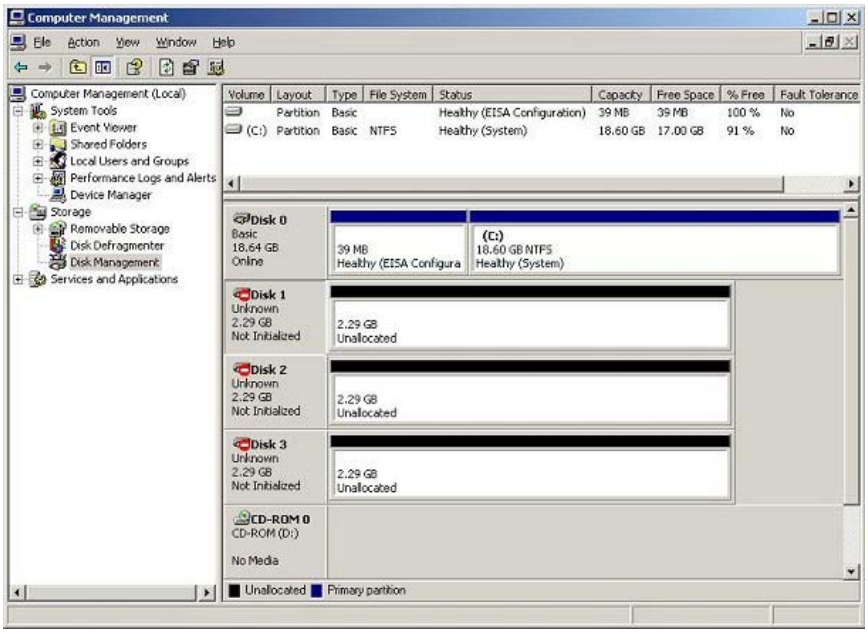
Configure disk devices

Disk arrays are configured using the same procedure for configuring any new disk on the host. This includes the following procedures:

- Writing signatures
- Creating and formatting disk partitions
- Verifying file system operations

Writing signatures

1. Right-click on the **My Computer** desktop icon and click **Manage**.
2. Click **Disk Management**. A message notifies you that disks have been added.



3. Click **OK** to update the system configuration and start the **Write Signature** wizard, which allows you to write signatures to the disks.
4. For each new disk, click **OK** to write a signature, or click **No** to prevent writing a signature.
5. When you have performed this process for all new disks, the Disk Management main window opens and displays the added disks.

Creating and formatting disk partitions

Dynamic Disk is supported with no restrictions for a disk array connected to a Windows 2000/ 2003 system. Refer to Microsoft's online help for details.

△ CAUTION:

Do not partition or create a file system on a device that will be used as a raw device (for example, some database applications use raw devices.)

1. In the **Disk Management** main window, select the unallocated area for the SCSI disk you want to partition.
2. Click the **Action** menu, and click **Create Partition** to launch the New Partition Wizard. Follow the Partition Wizard to create and format partitions and assign drive letters. Format partitions with the following settings and format options.

   File System: **NTFS** (enables Windows to write to the disk).

   Allocation unit size: "Default." Do not change this entry.

   Volume label: Enter a volume label, or leave this field blank for no label.

   Format Options: Click **Perform a Quick Format** to decrease the time required to format the partition. Click **Enable file and folder compression** only if you want to enable compression.
3. Verify the Disk Management main window displays the correct file system (NTFS) for the formatted partition. The word "Healthy" indicates that the partition has been created and formatted successfully.
4. Repeat this procedure for each new disk device.
5. Exit Disk Management, clicking **Yes** to save your changes.

Verifying file system operations

1. Open **My Computer** and check that the new disks are present.
2. Right-click each disk to view **Properties** and verify the properties are correct (label, type, capacity, and file system).
3. Copy a file from an existing drive to each new drive to verify the new drives are working, and then delete the copies.

2 Troubleshooting

This section includes resolutions for various error conditions you may encounter.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See Calling the HP support center.

Error conditions

Depending on your system configuration, you may be able to view error messages (R-SIMS) as follows:

- In Remote Web Console XP (Status tab)
- In Command View XP Advanced Edition (“Alerts” panel).
- In Command View XP (Event History or Event Notification panels) (XP arrays only)

Error condition	Recommended action
The logical devices are not recognized by the host.	Verify that the READY indicator lights on the disk array are ON. Verify that fiber cables are correctly installed and firmly connected. Verify that the target IDs are properly configured. The LUNs for each TID must start at 0 and continue sequentially without skipping any numbers. Verify that the TIDs/WWNs on each bus are unique. Do not install two devices with the same ID on the same bus. Recheck the buses for new devices. Verify that LUSE devices are not intermixed with normal LUNs on the same port. Verify that the maximum number of LUSE devices per port has not been exceeded. Verify that the disk array host mode is set correctly.
The host does not reboot properly after hard shutdown.	If you power off the host without executing the shutdown process, wait three minutes to allow the disk array’s internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.
Physical volumes cannot be created.	Verify that the disk array logical devices are correctly formatted.
Logical volumes cannot be created.	Verify that the volume capacity for OPEN-x volumes is not greater than the maximum capacity allowed. See the Device Emulations Appendix. Verify that the capacity of the volume group is not less than the total capacity of the partitioned logical volume.
A file system is not mounted after rebooting.	Verify that the host was restarted correctly. Verify that the file system attributes are correct.
The disk array performs a self reboot because the disk array was busy or it logged a panic message.	Reboot the host.
The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out.	Contact HP.
The host detects a parity error.	Check the HBA and make sure it was installed properly. Reboot the host.
The host hangs or devices are declared and the host hangs.	Make sure there are no duplicate disk array TIDs and that disk array TIDs do not conflict with any host TIDs.

Calling the HP support center

If you are unable to resolve an error condition, contact the HP support center for assistance.

Contact information

Telephone numbers for worldwide technical support are listed on the HP support web site: http://www.hp.com/support/.

Before you call

Be sure to have the following information available:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

A Path worksheet

LDEV (CU:LDEV) (CU = control unit)	Device Type	SCSI Bus Number	Path 1	Alternate Paths		
0:00				TID: LUN:	TID: LUN:	TID: LUN:
0:01				TID: LUN:	TID: LUN:	TID: LUN:
0:02				TID: LUN:	TID: LUN:	TID: LUN:
0:03				TID: LUN:	TID: LUN:	TID: LUN:
0:04				TID: LUN:	TID: LUN:	TID: LUN:
0:05				TID: LUN:	TID: LUN:	TID: LUN:
0:06				TID: LUN:	TID: LUN:	TID: LUN:
0:07				TID: LUN:	TID: LUN:	TID: LUN:
0:08				TID: LUN:	TID: LUN:	TID: LUN:
0:09				TID: LUN:	TID: LUN:	TID: LUN:
0:10				TID: LUN:	TID: LUN:	TID: LUN:
0:11				TID: LUN:	TID: LUN:	TID: LUN:
0:12				TID: LUN:	TID: LUN:	TID: LUN:
0:13				TID: LUN:	TID: LUN:	TID: LUN:
0:13				TID: LUN:	TID: LUN:	TID: LUN:
0:14				TID: LUN:	TID: LUN:	TID: LUN:
0:15				TID: LUN:	TID: LUN:	TID: LUN:
0:16				TID: LUN:	TID: LUN:	TID: LUN:
0:17				TID: LUN:	TID: LUN:	TID: LUN:

B Disk array supported emulations

This appendix provides information about supported emulations and emulation specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

Supported emulations

XP model	Emulation	Emulation supported	LUSE	CVS	LUSE & CVS
XP10000 XP12000 SVS200	OPEN-3	Yes	Yes	Yes	Yes
	OPEN-8	Yes	Yes	Yes	Yes
	OPEN-9	Yes	Yes	Yes	Yes
	OPEN-E	Yes	Yes	Yes	Yes
	OPEN-K				
	OPEN-L	Yes	Yes		
	OPEN-M				
	OPEN-V	Yes	Yes		

NOTE:

For the SVS200, and the XP12000/XP10000 when connected to external storage devices, HP recommends using OPEN-V as the emulation the array makes visible to the host. This allows external storage LDEVs to be configured without losing data. Using any other emulation may cause data loss in the external storage LUNs.

Emulation specifications

Emulation *(Note 1)*	Category *(Note 2)*	Blocks (512 bytes)	Sector Size (bytes)	# of Cylinders	Heads	Sectors per track	Capacity MB* *(Note 3)*
OPEN-3	SCSI disk	4806720	512	3338	15	96	2347
OPEN-8	SCSI disk	14351040	512	9966	15	96	7007
OPEN-9	SCSI disk	14423040	512	10016	15	96	7042
OPEN-E	SCSI disk	28452960	512	19759	15	96	13893
OPEN-L	SCSI disk	71192160	512	49439	15	96	34761
OPEN-V	SCSI disk	max=125827200	512	Note 5	15	128	Note 6
LUSE							
OPEN-3*n	SCSI disk	4806720*n	512	3338*n	15	96	2347*n
OPEN-8*n	SCSI disk	14351040*n	512	9966*n	15	96	7007*n
OPEN-9*n	SCSI disk	14423040*n	512	10016*n	15	96	7042*n
OPEN-E*n	SCSI disk	28452960*n	512	19759*n	15	96	13893*n
OPEN-L*n	SCSI disk	71192160*n	512	49439*n	15	96	34761*n
OPEN-V*n	SCSI disk	max=125827200 Note 4	512	Note 5	15	128	Note 6
CVS							
OPEN-3 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9 CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
CVS LUSE							
OPEN-3*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-8*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-9*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-E*n CVS	SCSI disk	Note 4	512	Note 5	15	96	Note 6
OPEN-V*n	SCSI disk	Note 4	512	Note 5	15	128	Note 6

*Capacity = (512 x number of blocks) ÷ 1024^2

Note 1:

The availability of an emulation depends on the disk array.

Note 2:

The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

Note 3:

The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

Note 4:

The number of blocks for a CVS volume is calculated as follows:

# of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

Example

```
For an OPEN-3 CVS volume with capacity = 37 MB:
# of blocks = (53 cylinders-see Note 5) × (15 heads) ×
(96 sectors per track) = 76320
```

Example

```
For an OPEN-V CVS volume with capacity = 49 MB:
# of blocks = (53 cylinders-see Note 5) × (15 heads) ×
(128 sectors per track) = 101760
```

Note 5:

The number of cylinders for a CVS volume is calculated as follows (↑...↑ means that the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of cylinders for a CVS volume = # of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

Example

```
For an OPEN-3 CVS volume with capacity = 37 MB:
# of cylinders = ↑37 × 1024/720↑ = ↑52.62↑
(rounded up to next integer) = 53 cylinders
```

OPEN-V: The number of cylinders for a CVS volume = # of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

Example

```
For an OPEN-V CVS volume with capacity = 49 MB:
# of cylinders = ↑49 × 16/15↑ = ↑52.26↑
(rounded up to next integer) = 53 cylinders
```

OPEN-3/8/9/E: The number of cylinders for a CVS LUSE volume = # of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑ × n

Example

```
For a CVS LUSE volume with capacity = 37 MB and n = 4:
# of cylinders = ↑37 × 1024/720↑ × 4 = ↑52.62↑× 4 = 53 × 4 = 212
```

OPEN-V: The number of cylinders for a CVS LUSE volume = # of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑ × n

Example

```
For an OPEN-V CVS LUSE volume with capacity = 49 MB and n = 4:
# of cylinders = ↑49 × 16/15↑ × 4 = ↑52.26↑× 4 = 53 × 4 = 212
```

Note 6:

The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using Remote Web Console, Command View (XP arrays only), or Command View XP Advanced Edition.

Glossary

AL	Arbitrated loop.
AL-PA	Arbitrated loop physical address.
array group	A group of 4 or 8 physical hard disk drives (HDDs) installed in an XP disk array and assigned a common RAID level. RAID1 array groups consist of 4 (2D+2D) or 8 HDDs (4D+4D). RAID5 array groups include a parity disk but also consist of 4 (3D+1P) or 8 HDDs (7D+1P). All RAID6 array groups are made up of 8 HDDs (6D+2P).
BC	HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array.
CA	HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array.
Command View (CVXP)	HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation.
Command View XP Advanced Edition (CVXP AE)	HP StorageWorks Command View XP Advanced Edition, installs on the user-provided Device Manager server and provides a browser-based platform from which you can manage the SVS200 and the XP family of disk arrays—even globally distributed arrays.
command device	A volume on the disk array that accepts Continuous Access or Business Copy control operations which are then executed by the disk array.
CU	Control Unit. Contains LDEVs and is approximately equivalent to SCSI Target ID.
CVS	Custom volume size. CVS devices (OPEN-x CVS) are custom volumes configured using array management software to be smaller than normal fixed-size OPEN system volumes. Synonymous with volume size customization (VSC).
DKC	The array cabinet that houses the channel adapters and service processor (SVP).
DKU (disk cabinet unit)	The array cabinets that house the disk array physical disks.
emulation modes	The logical devices (LDEVs) associated with each RAID group are assigned an emulation mode that makes them operate like OPEN system disk drives. The emulation mode determines the size of an LDEV: OPEN-3: 2.46 GB OPEN-8: 7.38 GB OPEN-9: 7.42 GB OPEN-E: 13.56 GB OPEN-L: 36 GB OPEN-V: User-defined custom size
failover	Disconnecting a failed unit or path and replacing it with an alternative unit or path in order to continue functioning.
FC	Fibre Channel.
FC-AL	Fibre Channel arbitrated loop.
FCP	Fibre Channel Protocol.
GB	Gigabytes.

HBA	Host bus adapter.
host mode	Each port can be configured for a particular host type. These modes are represented as two-digit hexadecimal numbers. For example, host mode 08 represents an HP-UX host.
LDEV	Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-L). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is often used synonymously with the term volume.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
LUSE	A LUN is normally associated with only a single LDEV. The LUSE feature allows a LUN to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage. The LUSE feature is available when the HP StorageWorks LUN Configuration and Security Manager product is installed.
OFC	Open Fibre Control.
OPEN-*x*	A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L).
OS	Operating system.
PA	Physical address.
path	"Path" and "LUN" are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs.
port	A physical connection that allows data to pass between a host and the disk array. The number of ports on an XP disk array depends on the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports Fibre Channel (FC) ports as well as other port types. Ports are named by port group and port letter, such as CL1-A. CL1 is the group, and A is the port letter.
RAID	Redundant array of independent disks.
remote console PC	The PC running HP StorageWorks Remote Control XP.
Remote Control (RC)	HP StorageWorks Remote Control XP. A software product used for managing XP arrays.
Remote Web Console (RWC)	HP StorageWorks XP Remote Web Console. A browser-based program installed on the SVP that allows you to configure and manage the disk array.
R-SIM	Remote service information message.
SCSI	Small computer system interface.
SIM	Service information message.
SNMP	Simple Network Management Protocol.
SVP	Service processor, which is the PC built into the disk controller. The SVP provides a direct interface into the disk array. SVP use is reserved for HP support representatives only.
SVS	Storage Virtualization System, an appliance that manages multiple disk array storage systems.

TB	Terabyte.
TID	Target ID.
Volume	On the XP array, a volume is a uniquely identified virtual storage device composed of a control unit (CU) component and a logical device (LDEV) component separated by a colon. For example 00:00 and 01:00 are two uniquely identified volumes; one is identified as CU = 00 and LDEV = 00, and the other as CU = 01 and LDEV = 00; they are two unique separate virtual storage devices within the XP array.
VSC	Volume size customization. Synonymous with CVS.
WWN	World Wide Name. A unique identifier assigned to a Fibre Channel device.

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